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A new species of *Mycena* sect. *Sacchariferae* from the Iberian cushion-shaped *Genisteae*

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Abstract— *Mycena acanthophila*, collected from several localities in Spain, is described as a new species. It specialises by growing on dead branches of two spiny, cushion-shaped species of *Leguminosae*. A complete description, drawings, and microphotographs showing the morphological characters are accompanied by comparisons with morphologically related taxa.

Key words— acanthocysts, *Echinospartum*, *Erinacea*, nomenclature, taxonomy

Introduction

Mycena sect. *Sacchariferae* was first published as a nomen nudum by Kühner (1938) and later validated by Singer (1962). This section is characterised by the presence of acanthocysts in the pileipellis, which form a subhymeniform layer on primordials and remain as terminal hyphal cells of the hyphae when the pileipellis becomes a cutis with age. Desjardin (1995) subdivided sect. *Sacchariferae* into three provisional stirps, *Amparoina*, *Adscendens*, and *Alphitophora*), based on the presence or absence of cherocytes, caulocystidial morphology, and the presence or absence of a basal disc.

Maas Geesteranus & de Meijer (1998) added another stirps named *Fuscinea*, close to *Alphitophora* but with brownish contents in the acanthocysts of the pileipellis.

According to Robich (2003), only seven species of sect. *Sacchariferae* have been found in Europe: *M. adscendens* Maas Geest., *M. alphitophora* (Berk.) Sacc., *M. cecidiophila* A.P. Berg et al., *M. corynephora* Maas Geest., *M. nucicola* Huijsman, *M. occulta* Harmaja, and *M. querciramuli* Robich. Here, we describe an apparently common new species from the Iberian Peninsula with a very

specific habitat: dead branches of *Echinospartum* and *Erinacea*, two spiny cushion-shaped genera in tribe *Genisteae*.

Materials & methods

Specimens were collected in the field and photographed when fresh with a Canon EOS 50D. The macromorphological study was based on both fresh specimens and photographs. The micromorphological study was performed mostly on air-dried basidiomata, rehydrated with commercial ammonia or 3% KOH, and stained with Congo Red. Melzer's reagent was used for testing amyloid and dextrinoid reactions. Measurements were all taken in ammonia solution with a Jeulin light microscope, under a 100× immersion oil objective and 10× oculars. The hilar appendix was excluded for basidiospore measurements, as well as excrescences for the other elements. The range of dimensions outside the parentheses is provided after manually rejecting 5% of the highest and lowest values, while the extremes are provided between parentheses. The Q coefficient is calculated as length/breadth. Drawings were done by direct observation. Dehydrated samples with absolute ethanol were dried by the critical point technique for the scanning electron microscopy (SEM) study, which was done with a Hitachi S-4100 microscope. GPS data are according to the World Geodetic System datum, WGS84. Studied specimens are deposited in the herbaria AH (Universidad de Alcalá, Alcalá de Henares, Madrid), and VAL (Faculty of Biological Sciences, Universitat de València, Valencia), which acronyms follow Thiers (2012). Terminology follows that of Desjardin (1995).

Mycena acanthophila J.C. Zamora & Català, **sp. nov.** Plates 1–3

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Differs from other species in *Mycena* sect. *Sacchariferae* by its yellowish basidiomata, pliciform lamellae, and clamped hyphae.

Type: Spain, Aragón, Huesca, Jaca, San Juan de la Peña, 42°30′18″N 0°38′13″W, alt. 1125 m, on *Echinospartum horridum* branches, 11-X-2010, J. Hernanz, J.C. Zamora & S. Català (**holotypus**, AH 40678; **isotypus,** VAL_MYCO 939).

Etymology: From the Greek ἄκανθος, spine, and φίλος, friend, due to the habitat and association with *Echinospartum* and *Erinacea*.

Macrocharacters— Pileus broadly conical to hemispherical at first, soon broadly convex and with or without an umbo, finally plane or with the margin slightly recurved in over-mature basidiomata; 0.4–1.7 mm diam.; granulose; bright yellow in young basidiomata, pale yellow with a more coloured disc when mature. Stipe central, filiform, cylindrical to slightly bulbous but never with a basal disc; 0.5–4 × 0.08–0.16 mm; dry, with a granulose surface; bright yellow when young, paler when mature. Lamellae often present in medium-sized to large basidiomata, adnate to more or less decurrent, 0–6, pliciform, never reaching the margin, pale yellowish to almost white; lamellar edge concolorous with faces, smallest basidiomata often with a smooth hymenophore; lamellulae absent in all cases. Smell absent. Taste not recorded.

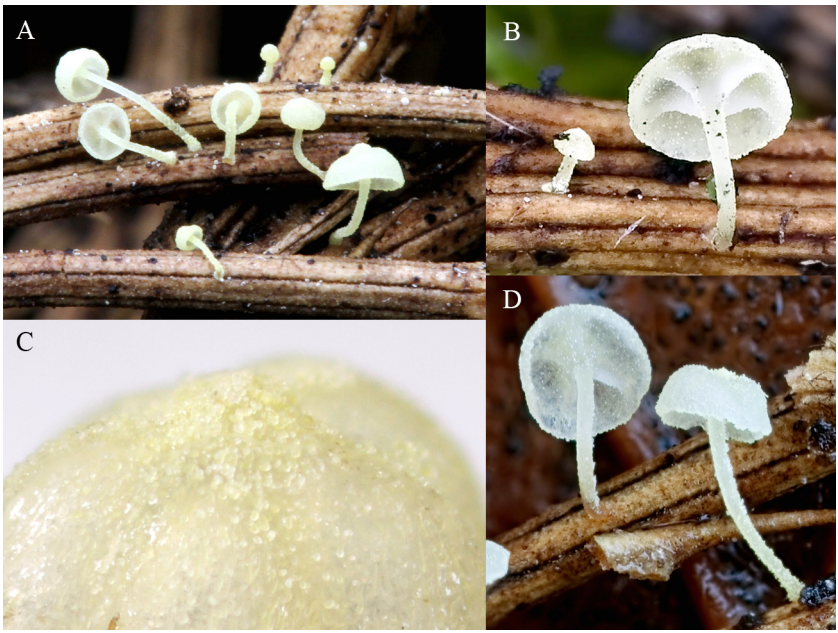

Plate 1—*Mycena acanthophila* macroscopic features. A, some basidiomata of the holotype collection. B, basidioma showing well-developed lamellae. C, detail of the granulose pileus surface, due to the presence of acanthocysts. D, basidioma with almost smooth hymenophore. (Photographers, A: S. Català; B, C & D: J. Hernanz)

Microcharacters— Basidiospores subglobose to broadly ellipsoid, rarely globose or ellipsoid, often subamygdaliform to citriform (both ends slightly pointed), (7.5–)8–10 × (6–)6.5–8 µm, Q= 1.06–1.35(–1.42), amyloid; hilar appendix about 0.5 µm long. Basidia 4-spored (rarely a few 2-spored), mostly 22–31 × 9.5–11.5 µm, but sometimes a low percentage of basidia with a root-like base, then up to 40 µm long; sterigmata 3.5–5 µm long. Cheilocystidia present in basidiomata with more or less developed lamellae, claviform, 13.5–22 × 8.5–12 µm, covered with 1–3 µm long excrescences in the upper half. Pleurocystidia not seen. Lamellar trama hyphae 2–6 µm wide. Pileipellis composed of 5–8.5 µm wide hyphae and inflated cells ≤11 µm wide with excrescences on the upper side; acanthocysts protruding among hyphae, broadly clavate to sphaeropedunculate, 12–25 × 8–15 µm, covered with 1–3.5 (–4.5) µm long excrescences. Pileitrama hyphae 2.5–8 µm wide (broader near the margin). Caulocystidia claviform, short- to long-stalked, 12–40 × 6.5–12.5 µm, densely covered with 1–3.5(–5) µm long excrescences; sometimes up to 120 µm long, thin- to somewhat thick-walled, smooth hairs appearing at the base, inconstant. Stipitipellis hyphae 1.5–5 µm, densely covered with

1–3 µm long excrescences. Stipititrama hyphae 2.5–10 µm wide. Pileus and lamellar context more or less dextrinoid, stipe context strongly dextrinoid. Clamp connections present in most structures, but often inconspicuous, best seen in subhymenium.

Ecology & distribution—The ecology and distribution of *M. acanthophila* are linked with those of its *Echinospartum* and *Erinacea* hosts. Cushion-shaped communities of *Echinospartum horridum* (Vahl) Rothm. and *Erinacea anthyllis* Link dominate high level mountains on calcareous soils and are subject to some drought. *Echinospartum horridum* is an endemic species from northern Iberian Peninsula to southern France, while *Erinacea anthyllis* is widely distributed in the Iberian Peninsula, southern France, and northern Africa (Talavera 1999). Both hosts are able to grow under hard conditions, like strong winds, drought, poorly developed soils, and cold (Bonet et al. 2009).

Despite these stressful conditions, the microclimate created inside the cushion is suitable for basidiomata development, where a few fungal species can fruit. From an ecological standpoint, the new species can be considered highly specialised. We observed that *M. acanthophila* grows only inside cushions, and we never found it on the most exposed dead branches. What is more, basidiomata quickly dry up when extracted from the cushion when humidity is not extremely high. The species is very common in its habitat, so future records are to be expected in any place where the hosts are present and may even associate with other species of spiny pulvinular *Genisteae*.

Additional specimens examined— **SPAIN**. **Aragón**: Huesca, Arguis, monte Peiró, 42°20′N 1°42′W, alt. 1500 m, on *Echinospartum horridum* branches, 16-X-2010, J. Hernanz (AH 40679); Huesca, Caldearenas, puerto de Monrepós, 42°20′36″N 0°23′38″W, alt. 1280 m, on *E. horridum* branches, 12-X-2010, J.C. Zamora, J.C. Campos & S. Català (AH 40680); Castiello de Jaca, pista de las Blancas, 42°39′03″N 0°34′25″W, alt. 1145 m, on *E. horridum* branches, 11-X-2010, J. Hernanz, J.C. Zamora & S. Català (AH 40681); Fanlo, 42°35′28″N 0°01′17″W, alt. 1380 m, on *E. horridum* branches, 12-XII-2010, J. Hernanz (AH 40682); Jaca, Peña de Oroel, 42°31′N 0°31′W, alt. 1670 m, on *E. horridum* branches, 14-X-2010, J. Hernanz (AH 40683); Jaca, carretera de Navasa a Oroel, 42°31′16″N 0°28′55″W alt. 1060 m, on *E. horridum* branches, 11-X-2010, J. Hernanz, J.C. Zamora & S. Català (AH 40684); Jaca, San Juan de la Peña, 42°30′25″N 0°39′01″W, alt. 1250 m, on *E. horridum* branches, 10-X-2010, J.C. Zamora, S. Català, J. Hernanz & P.P. Daniëls (AH 40685); 13-XII-2010, J. Hernanz, AH 40686; 42°30′N 0°40′W, alt. 1260 m, on *E. horridum* branches, 12-X-2010, J. Hernanz (AH 40687); 42°30′40″N 0°39′47″W, alt. 1275 m, on *E. horridum* branches, 11-XII-2010, J. Hernanz (AH 40688); 42°30′41.5″N 0°39′51.2″W, alt. 1270 m, 28-XII-2010, J. Hernanz (AH 40689); 42°30′18″N 0°41′04″W, alt. 1330 m, on *E. horridum* branches, 13-XII-2010, J. Hernanz (AH 40690); Santa Cruz de la Serós, San Juan de la Peña, 42°30′54″N 0°41′10″W, alt. 1118 m, on *E. horridum* branches, 13-XII-2010, J. Hernanz (AH 40691); Torla, puerto de Cotefablo, 42°36′56″N 0°12′07″W, alt. 1510 m, on *E. horridum* branches, 12-XII-2010, J. Hernanz (AH 40692); Villanúa, fuente del Paco, 42°04′13″N 0°03′13″W, alt. 1190 m, on *E. horridum* branches, 10-X-2010, J.C. Zamora & S. Català (AH 40693); Yebra de Basa, Santa Orosia, 42°30′N 0°15′W, alt. 1530 m, on *E. horridum* branches, 15-

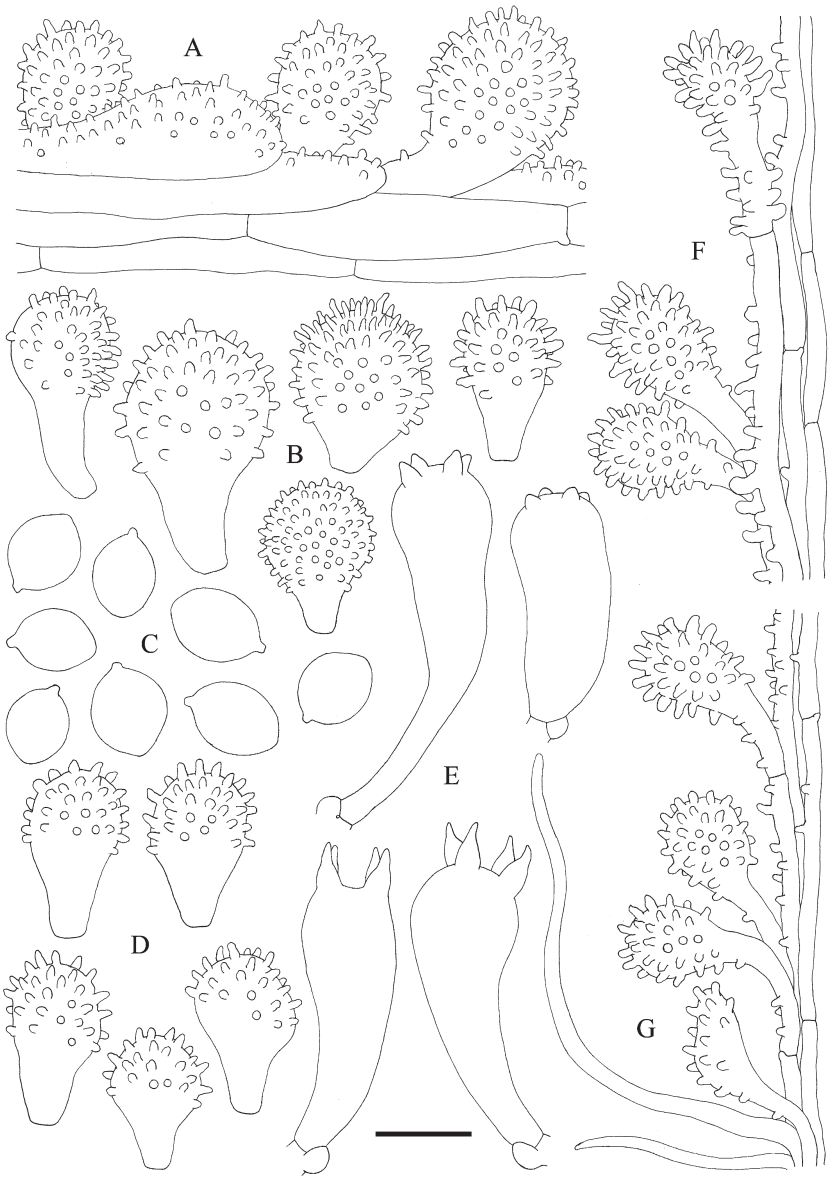

Plate 2— *Mycena acanthophila* microscopic features. A, hyphae of the pileipellis and protruding acanthocysts. B, morphological variation of some detached acanthocysts. C, basidiospores. D, cheilocystidia. E, basidia, including one with a root-like base. F, caulocystidia at the middle part of the stipe. G, caulocystidia at the stipe base, with inconstant smooth hairs. Scale bar = 10 μm.

X-2010, J. Hernanz (AH 40694); Yésero, puerto de Cotefablo, 42°36′57″N 0°12′34″W, alt. 1420 m, on *E. horridum* branches, 12-XII-2010, J. Hernanz (AH 40695). **Castilla la Mancha**: Guadalajara, embalse de Alcorlo, 41°00′36.5″N 3°01′19.8″W, alt. 940 m, on *Erinacea anthyllis* branches, 28-XI-2010, J.C. Campos & J. Hernanz (AH 40696); Somolinos, Sierra de la Pela, 41°15′20.3″N 3°01′19.8″W, alt. 1300 m, on *E. anthyllis* branches, 8-I-2011, J. Hernanz (AH 40697). **Comunidad Valenciana**: Castellón, El Toro, Sierra de el Toro, 39°54′44.87″N 0°48′39.50″W, alt. 1464 m, on *E. anthyllis* branches, 15-X-2010, G. Salvà & S. Català (VAL_MYCO 940). **Navarra**: Lumbier, subida Leyre-Arangoiti, 42°38′40.9"N 1°11′48.9″W, alt. 1340 m, on *E. anthyllis* branches, 31-XII-2010, J. Hernanz (AH 40698).

Comments— *Mycena acanthophila* is placed in sect. *Sacchariferae*, stirps *Alphitophora* based on the pileipellis with acanthocysts, absence of cherocytes, presence of caulocystidia that are densely covered by small warts or spinules, and a stipe without a basal disc (Desjardin 1995). It is well characterised macroscopically by its tiny size, yellowish colouration, comparatively short stipe, and reduced (sometimes absent) lamellae; the often subamygdaliform to citriform basidiospores are also quite unusual.

Two species in sect. *Sacchariferae* with a reduced hymenophore, *M. echinocephala* (G.F. Atk.) Desjardin and *M. cylindrospora* A.H. Sm., also belong to stirps *Alphitophora*. *Mycena echinocephala,* known only from the holotype, differs by the smooth caulocystidia terminated by a spinulose cell [but Desjardin (1993) observed only an amorphous apex when studying the type], unclamped hyphae, different basidiospores, and white basidiomata. *Mycena cylindrospora* can be distinguished by unclamped hyphae, absence of hymenial cystidia, different basidiospores, smooth hymenophore, infundibuliform pilei at maturity, and white basidiomata. Both species grow on *Rhododendron* leaves.

Very few taxa in this section have been described with a yellowish colouration. Perhaps the most similar, *Mycena chloroxantha* Singer, is easily distinguished by the presence of cherocytes in the pileipellis (which places it in stirps *Amparoina*), well-developed close lamellae, ellipsoid basidiospores, very long caulocystidia, and absence of clamp connections. What is more, var. *chloroxantha* exhibits a well-developed, costate basal disc, which is absent in var. *appalachienensis* Desjardin (Desjardin 1995).

More recently described species in stirps *Alphitophora* — *M. dissimilis*, *M. pistacea*, *M. hylophila*, and *M. umbratilis* (Maas Geesteranus & de Meijer 1997, 1998) — all differ in well-developed lamellae, non-yellow basidiomata, and different anatomical features, particularly basidiospores. In addition, *M. dissimilis* and *M. pistacea* lack clamp connections.

Finally, the only two previously known European species of stirps *Alphitophora*, *M. alphitophora* and *M. corynephora*, are readily distinguished by larger white to greyish white basidiomata, well-developed lamellae, basidiospore shape and size (mostly pip-shaped to ellipsoid in *M. alphitophora* and subglobose in *M. corynephora*), and much longer caulocystidia that confer

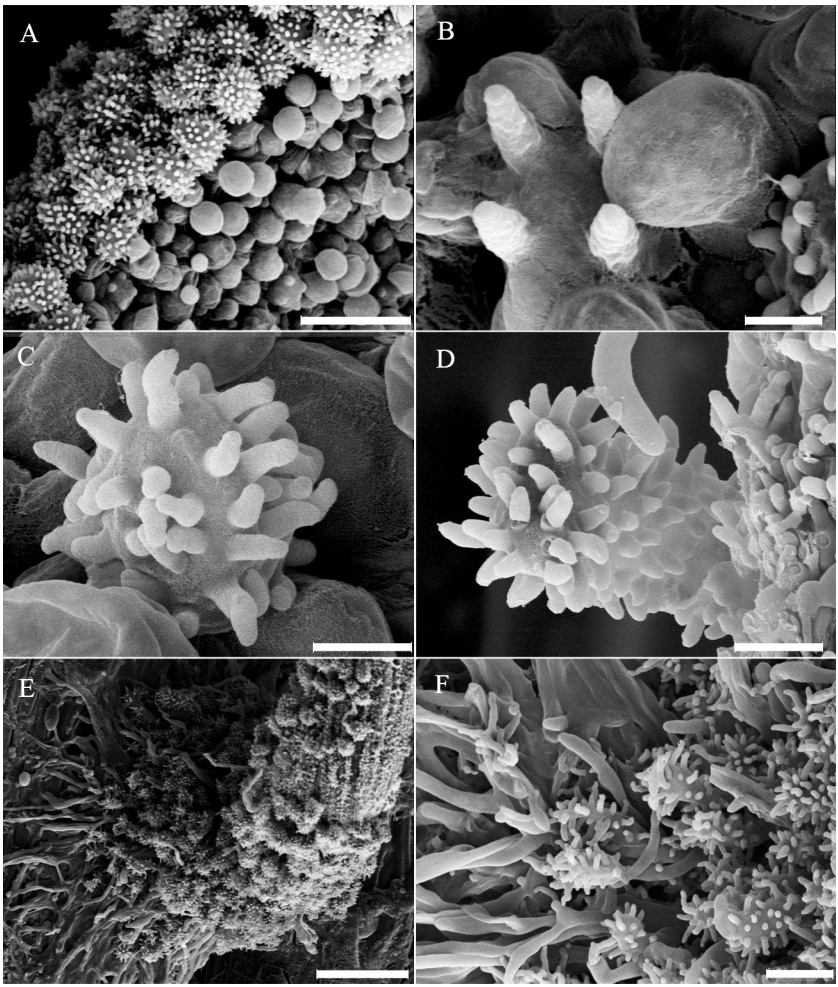

Plate 3— *Mycena acanthophila* SEM photographs. A: pileus margin showing the pileipellis with acanthocysts. B, 4-sterigmate basidia. C, cheilocystidium. D, caulocystidium. E, attachment of stipe with the substratum. F, detail of the stipe base. Scale bars: A = 20 µm; B, C = 3 µm; D = 4 µm; E = 50 µm; F = 10 µm.

a puberulous to hirsute appearance to the stipe surface (Desjardin 1995, Robich 2003).

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Literature cited

Bonet FJ, Zamora R, Gastón A, Molina C, Bariego P. 2009. Matorrales pulvinulares orófilos europeos meridionales. In: VV.AA., Bases ecológicas preliminares para la conservación de los tipos de hábitat de interés comunitario en España. Madrid: Ministerio de Medio Ambiente, y Medio Rural y Marino. 122 pp.

Desjardin DE. 1993. Notes on *Mycena cylindrospora* and *Eomycenella echinocephala*. Mycologia 85(3): 509–513. http://dx.doi.org/10.2307/3760711

Desjardin DE. 1995. A preliminary accounting of the worldwide members of *Mycena* sect. *Sacchariferae*. Bibliotheca Mycologica 159: 1–89.

Kühner R. 1938. Le genre *Mycena*. (Fries). Étude cytologique et systématique des espèces d'Europe et d'Amérique du Nord. Encyclopéde Mycologique 10: 1–710.

Maas Geesteranus RA, de Meijer AAR. 1997. Mycenae paranaenses. Kon. Ned. Akad. Wet. Verh., Afd. Nat., Tweede Reeks 97: 1–164.

Maas Geesteranus RA, de Meijer AAR. 1998. Further Mycenas from the state of Paraná, Brazil. Persoonia 17(1): 29–46.

Robich G. 2003. Mycena d'Europa. Associazione Micologica Bresadola, Trento.

Singer R. 1962. Diagnoses Fungorum novorum Agaricalium II. Sydowia 15: 45–83.

Talavera S. 1999. *Cytiseae*. In: S Talavera et al. (eds.) Flora iberica 7(1). Real Jardín Botánico, CSIC, Madrid.

Thiers B. 2012 [continuously updated]. Index Herbariorum: A global directory of public herbaria and associated staff. New York Botanical Garden's Virtual Herbarium. http://sweetgum.nybg.org/ih/